

## Patent Claims

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1. Liquid-crystal switching element comprising a liquid-crystal layer having an initial alignment which is essentially parallel to the substrates and is essentially untwisted, at least one polariser, a device for generating an electric field, which is aligned essentially parallel to the substrates in the case of liquid-crystal materials of negative dielectric anisotropy and is aligned essentially perpendicular to the substrates in the case of liquid-crystal materials of positive dielectric anisotropy, and, if desired, at least one birefringent layer, characterised in that the liquid-crystal layer has an optical retardation  $[(d \cdot \Delta n)_{LC}]$  in the range from  $0.05 \mu\text{m}$  to  $0.46 \mu\text{m}$ .
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2. Liquid-crystal switching element according to Claim 1, characterised in that it contains at least one linear polariser.
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3. Liquid-crystal switching element according to at least one of Claims 1 and 2, characterised in that the twist angle of the liquid-crystal layer ( $\phi$ ) is in the range from  $-25^\circ$  to  $+25^\circ$ .
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4. Liquid-crystal switching element according to at least one of Claims 1 to 3, characterised in that the optical retardation of the liquid-crystal layer is or can be switched from its initial value to essentially  $0 \text{ nm}$ .
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5. Liquid-crystal switching element according to at least one of Claims 1 to 4, characterised in that it is a transmissive or transfective liquid-crystal switching element.
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6. Liquid-crystal switching element according to at least one of Claims 1 to 5, characterised in that the optical retardation of the liquid-crystal layer is from  $0.20 \mu\text{m}$  to  $0.37 \mu\text{m}$ .
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7. Liquid-crystal switching element according to at least one of Claims 1 to 6, characterised in that the optical retardation of the liquid-crystal layer is from  $0.07 \mu\text{m}$  to  $0.17 \mu\text{m}$ .

8. Liquid-crystal switching element according to at least one of Claims 1 to 7, characterised in that it contains at least one birefringent layer.

5 9. Liquid-crystal switching element according to Claim 8, characterised in that it contains a  $\lambda/4$  layer, a  $\lambda/2$  layer or two  $\lambda/4$  layers.

10 10. Liquid-crystal switching element according to at least one of Claims 8 and 9, characterised in that the optical retardation of the birefringent layer or of the birefringent layers  $[(d \cdot \Delta n)_{BL}]$  corresponds either to essentially half or essentially twice the optical retardation of the liquid-crystal layer  $[(d \cdot \Delta n)_{LC}]$ .

15 11. Liquid-crystal switching element according to Claim 10, characterised in that the optical retardation of the liquid-crystal layer is from 0.20  $\mu\text{m}$  to 0.37  $\mu\text{m}$ , and the liquid-crystal switching element contains a  $\lambda/4$  layer.

20 12. Liquid-crystal switching element according to Claim 10, characterised in that the optical retardation of the liquid-crystal layer is from 0.07  $\mu\text{m}$  to 0.17  $\mu\text{m}$ , and the liquid-crystal switching element contains a  $\lambda/2$  layer or two  $\lambda/4$  layers.

25 13. Liquid-crystal switching element according to at least one of Claims 1 to 7, characterised in that the switching element contains no birefringent layer.

14. Liquid-crystal switching element according to Claim 13, characterised in that the twist angle of the liquid-crystal layer,  $(\phi)$  is from  $-6^\circ$  to  $+6^\circ$ .

30 15. Liquid-crystal switching element according to at least one of Claims 13 and 14, characterised in that the optical retardation of the liquid-crystal layer in the fully switched state is from 0 nm to 80 nm, preferably from 0 nm to 40 nm.

35 16. Liquid-crystal switching element according to at least one of Claims 13 to 15, characterised in that the liquid-crystal layer has positive dielectric anisotropy.

17. Liquid-crystal switching element according to at least one of Claims 13 to 16, characterised in that it can be operated in normally white mode.

5 18. Liquid-crystal switching element according to at least one of Claims 13 to 17, characterised in that it is a reflective liquid-crystal switching element.

10 19. Liquid-crystal switching element according to at least one of Claims 13 to 17, characterised in that it is a transmissive liquid-crystal switching element.

15 20. Liquid-crystal switching element according to at least one of Claims 13 to 15, characterised in that the liquid-crystal layer has negative dielectric anisotropy.

20 21. Electro-optical liquid-crystal display device, characterised in that it contains a liquid-crystal switching element or a plurality of liquid-crystal switching elements according to at least one of Claims 1 to 20.

22. Electro-optical liquid-crystal display device according to Claim 21, characterised in that it contains a multiplicity of liquid-crystal switching elements, and these are arranged in matrix form.

25 23. Electro-optical liquid-crystal display device according to Claim 21 or 22, characterised in that the liquid-crystal switching elements are addressed by means of a matrix of active electrical switching elements.

30 24. Use of an electro-optical liquid-crystal switching element or a plurality of electro-optical liquid-crystal switching elements according to at least one of Claims 1 to 20 in a liquid-crystal display device.

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